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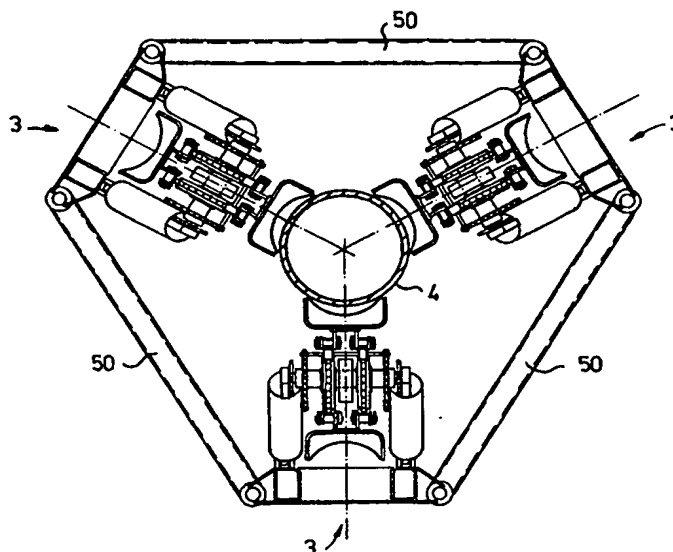
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claims and to be republished in the event of the receipt of
amendments.**In English translation (filed in Dutch).*

(54) Title: TENSIONER



(57) Abstract

The invention relates to a tensioner (2), for clamping cables, flexible pipes or bars and moving them forwards in a controlled manner, comprising at least two conveyor means (3), each intended to displace one or more clamping members (35), the shape of which is adapted to the external shape of the cables, flexible pipes or bars, and the conveyor means each being attached to a main frame element (50), all this in such a manner that the clamping members can be displaced while clamped around the cables, flexible pipes or bars, it being possible to construct tensioners in different ways with the aid of a number of standard components.

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EE	Estonia	LR	Liberia	SG	Singapore		

Title: Tensioner

The invention relates to a tensioner, for clamping cables, flexible pipes or bars and moving them forwards in a controlled manner, comprising at least two conveyor means, each intended to displace one or more clamping members, the shape of which is adapted to the external shape of the cables, flexible pipes or bars, and the conveyor means each being attached to a main frame element, all this in such a manner that the clamping members can be displaced while clamped around the cables, flexible pipes or bars.

Tensioners are used, inter alia, when laying cables and flexible pipes from a ship, for example on the sea bed. The cables, the flexible pipes or the bars are guided from the ship towards the sea bed using the tensioner, via the so-called S- or J-method. If the S-method is used, the cable or the flexible pipe leaves the ship essentially in the horizontal direction, and the cable or the flexible pipe will be connected to the part which has already been positioned on the sea bed (ground) via an S-bend. If the J-method is used, the cable or the flexible pipe leaves the ship essentially in the vertical direction and is connected to the part which has already been laid on the ground via a J-shaped bend.

The role of the tensioner is twofold. Firstly, the tensioner has to be able to clamp the cable or the flexible pipe fixedly, in order to prevent it leaving the ship at an uncontrolled speed as a result of the weight of the section which is transferred overboard. The weight which the tensioner has to stop in this way can rise to a very high level. The tensioner therefore has to be able to exert a high clamping force on the cable or the flexible pipe. The second role of the tensioner is to move the cables and the flexible pipes forwards. The maximum speed at which this takes place is dependent, inter alia, on the condition of the ground at that location. Moreover, the cable or the flexible pipe in most cases still has to be assembled on the deck of the ship during laying. The speed at which the assembled part is moved overboard is therefore dependent on the time which is required for assembling the cable or the flexible pipe itself.

In order to be able to satisfy the demands placed on the tensioners, generally at least two endless conveyors are incorporated in the tensioners according to the prior art. By moving the conveyors towards one another with a considerable force, a

high clamping force can be exerted on the cable or flexible pipe positioned between them. By then driving the conveyors, the cable or the flexible pipe can be advanced without losing the clamping force. Since the cables and the flexible pipes have an essentially round cross-section, the conveyors in a tensioner with two conveyors
5 therein are positioned at an angle of 180° . In a tensioner with three conveyors, they form an angle of 120° with respect to one another, and in the case of four conveyors their mutual angle is in each case 90° .

A significant drawback of the tensioners according to the prior art is that the design of a tensioner and the number of conveyors which are fitted therein depends
10 on the type of cable or flexible pipe for which the tensioner is designed. For example, a flexible pipe with, for example, a large diameter and a relatively thin wall may be pressed into an elliptical shape by two conveyors. For this reason, the tensioner for flexible pipes of this nature is generally equipped with three or four conveyors. This means that the operators of the ships for laying cables and flexible
15 pipes have to purchase a separate tensioner for each type of cable or flexible pipe, a fact which entails relatively high investment costs.

Another significant drawback of the tensioners according to the prior art is, furthermore, that there is generally only one tensioner on board a ship, owing to lack of space. It is therefore impossible to change from one type of tensioner to another
20 type of tensioner while at sea.

A third drawback of the tensioners according to the prior art is that the tensioners are relatively bulky. Owing to the size and weight of the tensioners according to the prior art, they are extremely expensive to transport.

The object of the present invention is to provide a tensioner which does not
25 exhibit the drawbacks of the tensioners according to the prior art.

In order to achieve this object, the tensioner according to the present invention is provided with conveyor means with clamping members, in which the conveyor means with the clamping members are of modular design, such that various tensioner designs can be constructed with the aid of a number of conveyor means and a
30 number of main frame elements.

The advantage of a tensioner of modular design is firstly the fact that various tensioners can be put together with the aid of a limited number of (at least two) identical conveyor means. The availability of the tensioner which is to be of modular

construction means that it is not necessary to purchase a new type of tensioner for each new type of cable or flexible pipe. Instead of a large number of different tensioners, a user only needs to purchase a limited number of these conveyor means. Moreover, the tensioners which are to be of modular construction are of relatively low weight and can be put together in a compact manner.

It is attempted to make the conveyor means with the clamping members of modular design in such a manner that they fit in an ISO container.

By adapting the dimensions of the conveyor means to the size of ISO containers, the conveyor means can be transported in a container or instead of a container. Transporting a tensioner according to the prior art always requires special precautionary measures and is therefore relatively expensive. By adapting the dimensions of the conveyor means to the dimensions of ISO containers, transporting the tensioner modules according to the present invention does not require any special precautionary measures. The transport costs for a modular tensioner will therefore be much lower than the transport costs for a bulky tensioner according to the prior art.

It is advantageous if the conveyor means comprise attachment eyelets for attaching the conveyor means to a main frame element.

The advantage of this measure is that a tensioner according to the present invention can be put together or altered easily and in a relatively short time.

The tensioner according to the present invention is improved still further if the conveyor means comprise a base frame and a conveyor which is arranged displaceably thereon, the conveyor being attached to the said base frame with the aid of at least one hydraulic cylinder and at least a first and a second pivot arm such that it can move essentially parallel with respect to the said base frame.

Moreover, in this case it is advantageous if the hydraulic cylinder and the pivot arms are all attached both to the base frame and to the conveyor, the attachment position of the hydraulic cylinder on the base frame corresponding to the attachment position of the first pivot arm thereon, and the attachment position of the cylinder on the conveyor corresponding to the attachment position of the second pivot arm thereon.

The advantage of a design of this nature is that only the hydraulic cylinder has to be actuated in order to displace the conveyor with respect to the base frame. In this design, the conveyor is kept parallel along the base frame by means of the pivot

arms.

In an advantageous embodiment of the present invention, the conveyor means comprise a conveyor which is provided with a drive chain of double design.

By employing a double chain, the conveyor will be less inclined to start to tilt, since the support provided by the belt is made wider. In a manner of speaking, the "wheel base" of the belt becomes wider as a result of a double chain being used. This measure improves the stability of the tensioner according to the present invention considerably by comparison with tensioners according to the prior art.

The present invention relates not only to a tensioner but also to a conveyor means of modular design which is intended for the tensioner according to the present invention. It is advantageous here for at least two conveyor means according to the present invention to be connected to one another by means of main frame elements, in which case preferably a limited number of variants of the said main frame elements are sufficient for constructing a tensioner having 2, 3, 4 or more conveyor means, as desired. This has the advantage that a tensioner which is suitable for any type of cable or flexible pipe can be constructed using a limited number of means together with a limited number of main frame elements. Furthermore, this offers the possibility of very compact design.

The construction and use of the present invention will be explained with reference to the following drawings, in which:

Figure 1 diagrammatically depicts how a cable or a flexible pipe is moved overboard via the S-method;

Figure 2 diagrammatically depicts how a cable or a flexible pipe is moved overboard via the J-method;

Figure 3 is a side view of the conveyor means according to the present invention;

Figure 4 is a cross-section on line IV-IV of the conveyor means in accordance with Figure 3;

Figure 5 is a cross-section of a tensioner with three conveyor means according to the present invention therein;

Figure 6 is a cross-section of a tensioner with two or four conveyor means according to the present invention therein.

Figure 1 diagrammatically depicts the case in which a tensioner 2 which is

positioned on a ship 1 is used to lay a cable or a flexible pipe 4 on the bed 5 of, for example, the sea via the so-called S-method. It can be seen in Figure 1 that the cable or the flexible pipe 4 leaves the ship 1 essentially in the horizontal direction. That part of the cable or flexible pipe 4 which is clamped fixedly by means of the
5 tensioner 2 is connected via an S-bend to the part which has already been laid on the bed 5.

Figure 2 diagrammatically depicts the case in which a cable or a flexible pipe 4 is laid on the bed 5 of, for example, the sea from a ship 1, with the aid of a tensioner 2, via the so-called J-method. It can be seen in the figure that the cable or
10 flexible pipe 4 leaves the ship 1 essentially in the vertical direction. That part of the cable or the flexible pipe 4 which is clamped fixedly by means of the tensioner 2 is connected in a J-shaped bend to the part which has already been placed on the bed 5.

It can be seen from Figures 1 and 2 that the tensioner 2 has two functions. Firstly, the tensioner 2 has to prevent the cable or the flexible pipe 4 from leaving
15 the ship 1 of its own accord as a result of its own weight. For this reason, the tensioner 2 has to be able to clamp the cable or the flexible pipe 4 fixedly. Secondly, the tensioner 2 has to be able to move the cable or flexible pipe 4 overboard without losing this clamping force. The tensioner 2 is therefore provided with at least two
20 conveyor means 3, comprising conveyors. The conveyors can be moved towards one another in order to clamp a cable or flexible pipe 4 fixedly. By moreover driving the conveyors, the cable or flexible pipe 4 can leave the ship 1 at a controlled speed.

Figure 3 shows the conveyor means according to the present invention. The conveyor means 3 comprise a base frame 31 and a conveyor 39 which is arranged movably with respect to this base frame 31. The conveyor 39 is attached, for
25 example, to the base frame 31 with the aid of at least one hydraulic cylinder 32 and two pivot arms 33. The hydraulic cylinder 32 and the pivot arms 33 are preferably attached to the base frame 31 via attachment eyelets 34. For its part, the conveyor 39 comprises, inter alia, clamping members 35 which can be pushed onto a cable or flexible pipe 4 which is to be displaced. The clamping members 35 are positioned on
30 a chain 36. This chain 36 is preferably of double design, in order to be able to support the clamping members 35 over their width (cf. Figure 4). The chain 36 of the conveyor is advanced, for example, with the aid of a toothed wheel 37. Moreover, the base frame 31 is provided with attachment eyelets 38, by means of which the

conveyor means 3 can be connected in a simple manner to, for example, a main frame.

Figure 4 shows a cross-section of the conveyor means 3 on line IV-IV, in accordance with Figure 3. The double chain 36 ensures that the clamping members 35 cannot tilt with respect to the base frame 31, not even if these members 35 are subjected to relatively high compressive forces. It is advantageous if the clamping members 35 have an essentially annular or V-shaped recess 40 on their outwardly directed surface. As a result, the overall circumference which the clamping members 35 of conveyors 39 placed in a tensioner (cf. Figures 5 and 6) delimit will also be annular.

Figure 5 shows a tensioner which is composed of three conveyor means 3 according to the present invention. The modules 3 are attached to one another with the aid of main frame elements 50. It can be seen in the figure that the main frame elements 50 are connected to the conveyor means 3 via the attachment eyelets 38.

Figure 6 shows the situation where a cable or a flexible pipe 4 is surrounded by two or four (shown in dashed lines) conveyor means 3 according to the invention.

It can be seen from Figures 5 and 6 that it is possible, as desired, to assemble two, three, four or, if desired, even more conveyor means 3 according to the present invention to form one tensioner. The number of conveyor means 3 to be used will depend on, inter alia, the thickness, the stiffness and the weight of the cable or flexible pipe to be displaced. The advantage of this is that it is not necessary to build a special tensioner for each type of cable or flexible pipe. Various different tensioners can be constructed using a limited number of conveyor means 3 according to the present invention and a number of standard main frame elements 50.

CLAIMS

1. Tensioner, for clamping cables, flexible pipes or bars and moving them forwards in a controlled manner, comprising at least two conveyor means, each intended to displace one or more clamping members, the shape of which is adapted to the external shape of the cables, flexible pipes or bars, and the conveyor means each being attached to a main frame element, all this in such a manner that the clamping members can be displaced while clamped around the cables, flexible pipes or bars, characterized in that the conveyor means (3) with the clamping members (35) are of modular design, such that various tensioner designs can be constructed with the aid of a number of conveyor means (3) and a number of main frame elements (50).
2. Tensioner according to Claim 1, characterized in that the conveyor means (3) with the clamping members (35) are designed in such a manner that they each fit in an ISO container.
3. Tensioner according to Claim 1 or 2, characterized in that the conveyor means (3) comprise attachment eyelets (38) for attaching the conveyor means (3) to a main frame element (50).
4. Tensioner according to Claim 1, 2 or 3, the conveyor means comprising a base frame and an endless conveyor which is arranged displaceably thereon, characterized in that the said conveyor (39) is attached to the said base frame (31) with the aid of at least one hydraulic cylinder (32) and at least a first and a second pivot arm (33) such that it can move essentially parallel with respect to the base frame (31).
5. Tensioner according to Claim 1, 2, 3 or 4, characterized in that the conveyor (39) is provided with a drive chain (36) of double design.
6. Conveyor means, intended for the tensioner according to one of the preceding claims.

1/3

fig -1

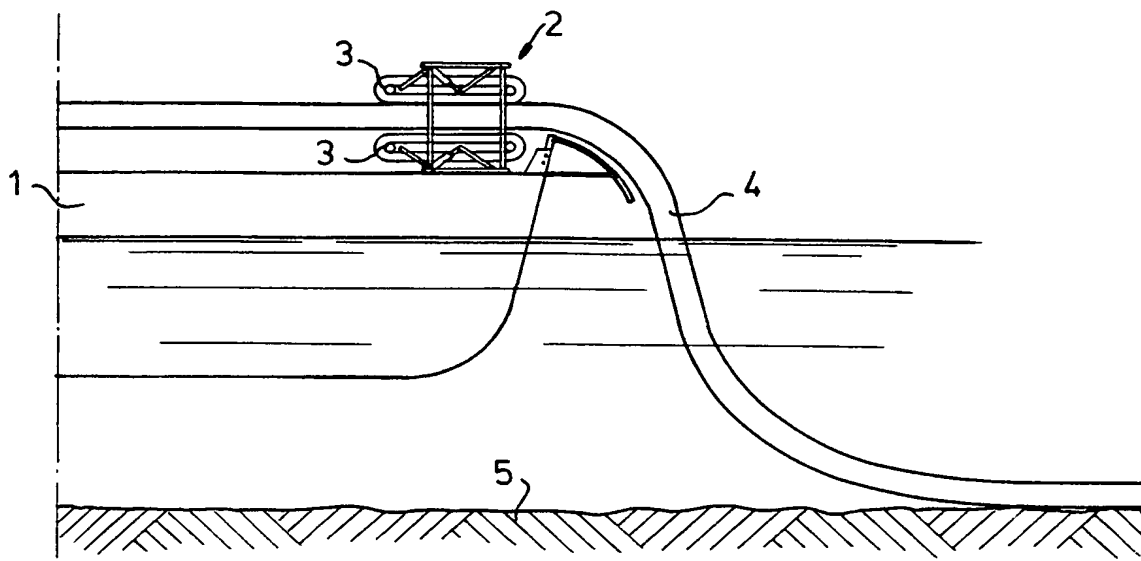
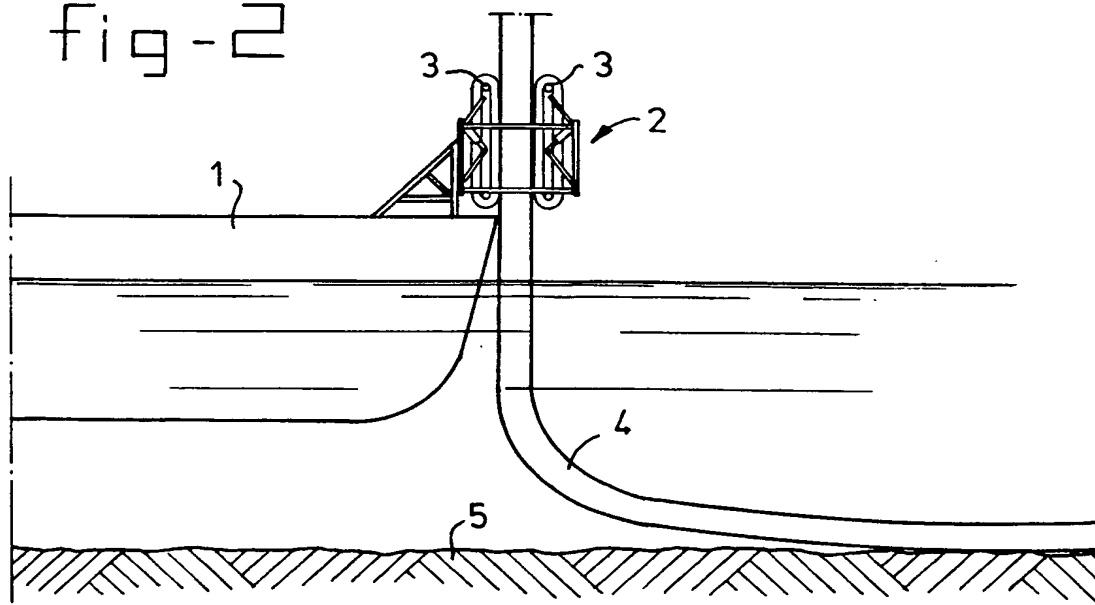


fig -2



2/3

fig - 3

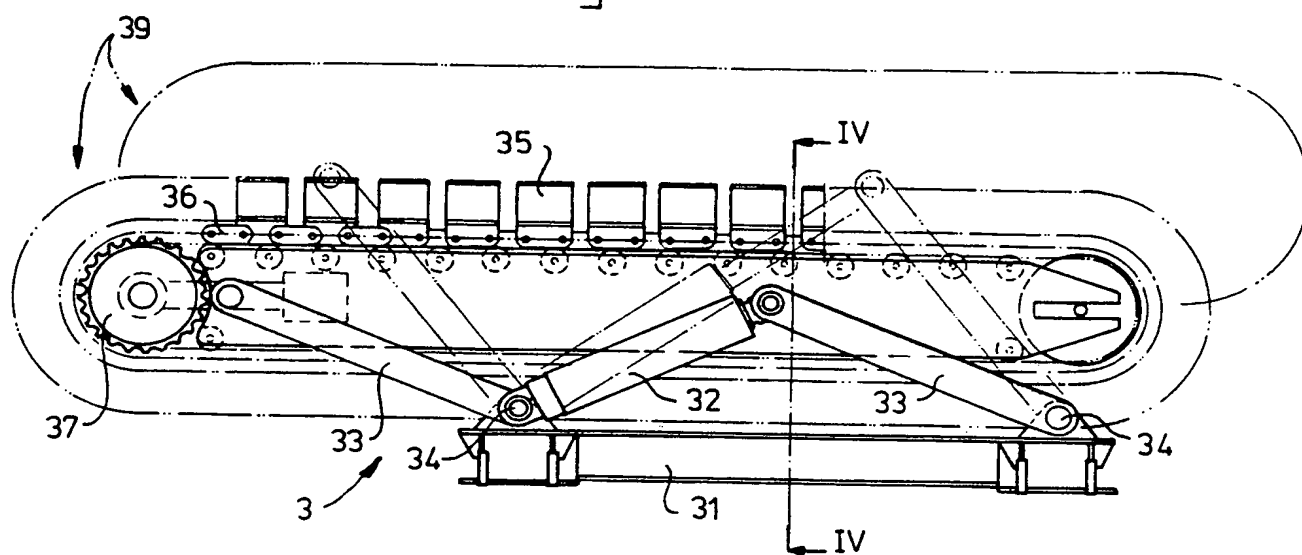
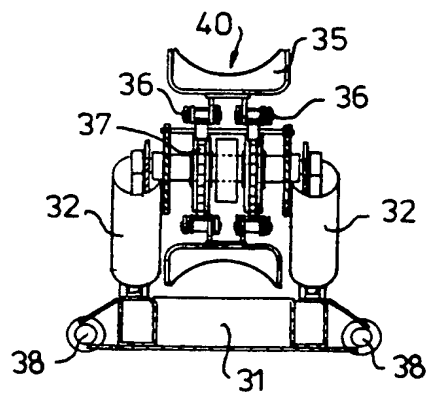


fig - 4



3/3

fig-5

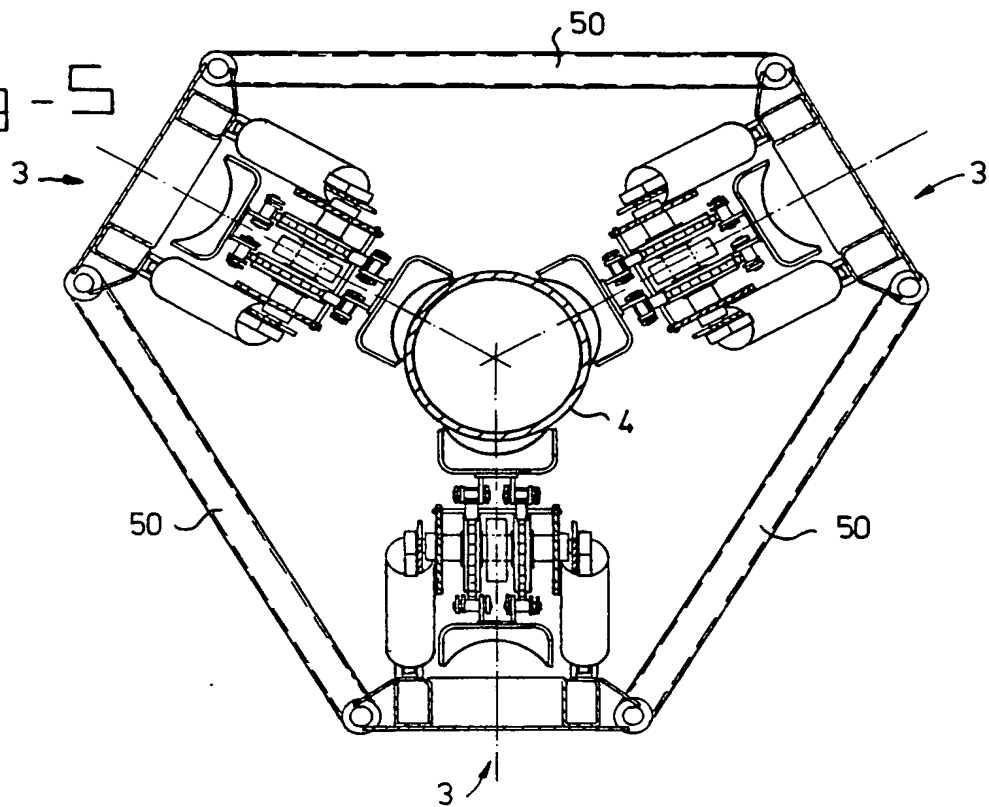
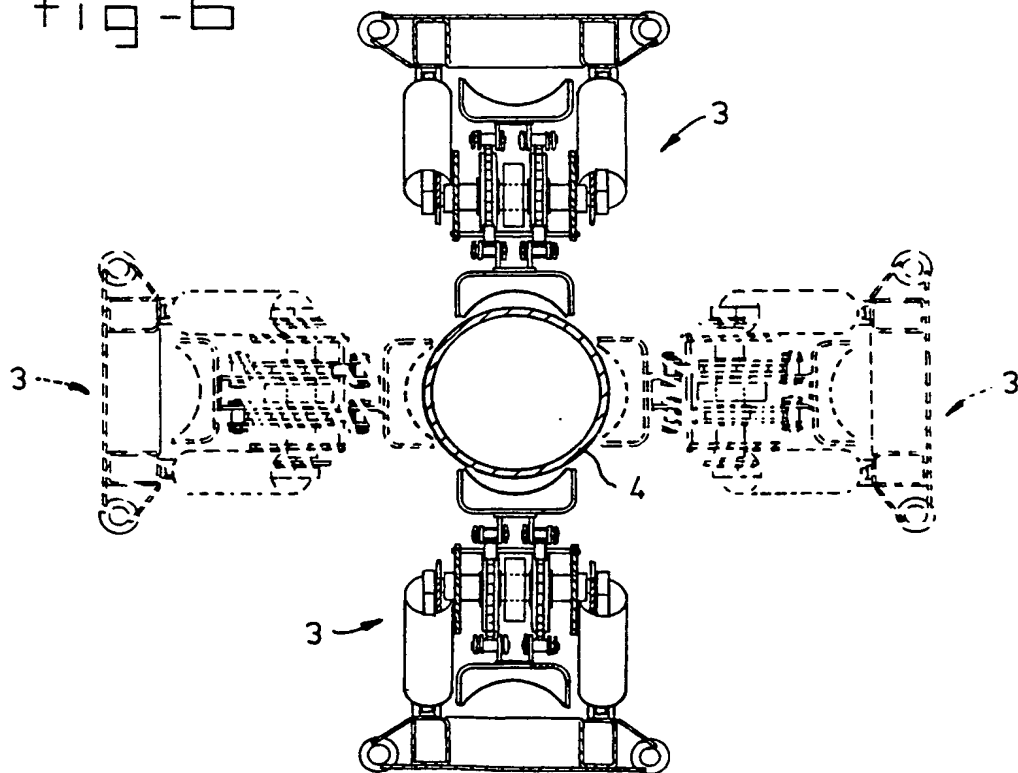


fig-6





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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BO 40971		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NL98/00245	International filing date (day/month/year) 04/05/1998	Priority date (day/month/year) 06/05/1997	
International Patent Classification (IPC) or national classification and IPC F16L1/23			
Applicant ITREC B.V. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none">I <input checked="" type="checkbox"/> Basis of the reportII <input type="checkbox"/> PriorityIII <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicabilityIV <input type="checkbox"/> Lack of unity of inventionV <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statementVI <input type="checkbox"/> Certain documents citedVII <input type="checkbox"/> Certain defects in the international applicationVIII <input type="checkbox"/> Certain observations on the international application			
Date of submission of the demand 10/11/1998		Date of completion of this report 10.02.99	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0 Tx: 523656 epmu d Fax: (+49-89) 2399-4465		Authorized officer Duerhammer, M Telephone No. (+49-89) 2399 	

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NL98/00245

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

Description, pages:

1-6 as originally filed

Claims, No.:

1-6 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NL98/00245

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-6
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-6
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-6
	No:	Claims	

2. Citations and explanations

see separate sheet

Section V,2:

The invention according to claim 1 refers to a tensioner for clamping cables, flexible pipes or bars and moving them forwards in a controlled manner, comprising at least two conveyor means, each intended to displace one or more clamping members, the shape of which is adapted to the external shape of the cables, flexible pipes or bars, and the conveyor means each being attached to a main frame element in such a manner that the clamping members can be displaced while clamped around the cables, flexible pipes or bars.

Such tensioners are generally known. They have the drawback that their design and the number of conveyors depends on the type of cable. This means that a separate tensioner must be provided for each type of cable which entails relatively high investment costs.

This problem is solved according to claim 1 by the fact that the conveyor means with the clamping members are of modular design, such that various tensioner designs can be constructed with the aid of a number of conveyor means and a number of main frame elements.

Independent claim 6 refers to a conveyor means intended for the tensioner according to claim 1.

The modular design of the clamping members in claims 1 and 6 means that it is not necessary to provide a new type of tensioner for each new type of cable or pipe. Instead of a large number of different tensioners only a limited number of conveyor means is needed. According to the invention two, three, four or even more conveyor means can be assembled to form one conveyor.

Because this idea is not obvious by the prior art documents the subject-matter of claims 1 and 6 fulfils the requirement of Article 33(2)(3) PCT.

Claims 2 to 5 contain special embodiments of the tensioner according to claim 1 so that the subject-matter of these claims also fulfils the requirement of Article 33(2)(3) PCT.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference B0 40971	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/NL 98/ 00245	International filing date (day/month/year) 04/05/1998	(Earliest) Priority Date (day/month/year) 06/05/1997
Applicant ITREC B.V. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 02 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).

2. ☐ Unity of invention is lacking (see Box II).

3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.

☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ Transcribed by this Authority

4. With regard to the title, ☒ the text is approved as submitted by the applicant

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

Figure No. 5 ☐ as suggested by the applicant.

☐ None of the figures.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NL 98/ 00245

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

Line 3 : after "tensioner" add (2)
Line 5 : after "means" add (3)
 after "members" add (35)
Line 7 : after "element add (50)

INTERNATIONAL SEARCH REPORT

National Application No

PCT/NL 98/00245

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F16L1/23

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 473 715 A (R. A. SHUEY) 21 October 1969 see claims 1-20; figures 1-6 ----	1
A	GB 1 250 032 A (N. V. INDUSTRIEELLE HANDELSCOMBINATIE HOLLAND) 20 October 1971 see claims 1-15; figures 1-4 ----	1
A	GB 2 210 673 A (SANTA FE INTERNATIONAL CORPORATION) 14 June 1989 see abstract; figures 1-31 ----	1
A	GB 2 286 647 A (STENA OFFSHORE LTD) 23 August 1995 see abstract; figures 1-10B -----	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

24 August 1998

Date of mailing of the international search report

03/09/1998

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk
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Fax: (+31-70) 340-3016

Authorized officer

Angius, P

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 98/00245


Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3473715	A	21-10-1969	NONE	
GB 1250032	A	20-10-1971	NL 6814678 A US 3589580 A	16-04-1970 29-06-1971
GB 2210673	A	14-06-1989	BR 8600951 A GB 2178129 A,B GB 2217424 A,B US 4820082 A US 4961671 A	04-03-1987 04-02-1987 25-10-1989 11-04-1989 09-10-1990
GB 2286647	A	23-08-1995	NONE	

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference BO 40971		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/NL98/00245		International filing date (day/month/year) 04/05/1998	Priority date (day/month/year) 06/05/1997
International Patent Classification (IPC) or national classification and IPC F16L1/23			
Applicant ITREC B.V. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 10/11/1998		Date of completion of this report 1 0. 02. 99	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0 Tx: 523656 epmu d Fax: (+49-89) 2399-4465		Authorized officer Duerhammer, M Telephone No. (+49-89) 2399	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NL98/00245

1. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-6 as originally filed

Claims, No.:

1-6 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/NL98/00245

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or Industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Yes:	Claims 1-6
	No:	Claims
Inventive step (IS)	Yes:	Claims 1-6
	No:	Claims
Industrial applicability (IA)	Yes:	Claims 1-6
	No:	Claims

2. Citations and explanations**see separate sheet**

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/NL98/00245

Section V,2:

The invention according to claim 1 refers to a tensioner for clamping cables, flexible pipes or bars and moving them forwards in a controlled manner, comprising at least two conveyor means, each intended to displace one or more clamping members, the shape of which is adapted to the external shape of the cables, flexible pipes or bars, and the conveyor means each being attached to a main frame element in such a manner that the clamping members can be displaced while clamped around the cables, flexible pipes or bars.

Such tensioners are generally known. They have the drawback that their design and the number of conveyors depends on the type of cable. This means that a separate tensioner must be provided for each type of cable which entails relatively high investment costs.

This problem is solved according to claim 1 by the fact that the conveyor means with the clamping members are of modular design, such that various tensioner designs can be constructed with the aid of a number of conveyor means and a number of main frame elements.

Independent claim 6 refers to a conveyor means intended for the tensioner according to claim 1.

The modular design of the clamping members in claims 1 and 6 means that it is not necessary to provide a new type of tensioner for each new type of cable or pipe. Instead of a large number of different tensioners only a limited number of conveyor means is needed. According to the invention two, three, four or even more conveyor means can be assembled to form one conveyor.

Because this idea is not obvious by the prior art documents the subject-matter of claims 1 and 6 fulfils the requirement of Article 33(2)(3) PCT.

Claims 2 to 5 contain special embodiments of the tensioner according to claim 1 so that the subject-matter of these claims also fulfils the requirement of Article 33(2)(3) PCT.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 98/00245

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 F16L1/23

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 473 715 A (R. A. SHUEY) 21 October 1969 see claims 1-20; figures 1-6 ---	1
A	GB 1 250 032 A (N. V. INDUSTRIEELLE HANDELSCOMBINATIE HOLLAND) 20 October 1971 see claims 1-15; figures 1-4 ---	1
A	GB 2 210 673 A (SANTA FE INTERNATIONAL CORPORATION) 14 June 1989 see abstract; figures 1-31 ---	1
A	GB 2 286 647 A (STENA OFFSHORE LTD) 23 August 1995 see abstract; figures 1-10B -----	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"Z" document member of the same patent family

Date of the actual completion of the international search

24 August 1998

Date of mailing of the international search report

03/09/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Angius, P

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/NL 98/00245

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3473715	A	21-10-1969	NONE	
GB 1250032	A	20-10-1971	NL 6814678 A US 3589580 A	16-04-1970 29-06-1971
GB 2210673	A	14-06-1989	BR 8600951 A GB 2178129 A,B GB 2217424 A,B US 4820082 A US 4961671 A	04-03-1987 04-02-1987 25-10-1989 11-04-1989 09-10-1990
GB 2286647	A	23-08-1995	NONE	

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

DE BRUIJN, Leendert, C.
Nederlandsch Octrooibureau
Scheveningseweg 82
P.O. Box 29720
NL-2502 LS The Hague
PAYS-BAS

Date of mailing (day/month/year) 14 May 1999 (14.05.99)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference BO 40971	
International application No. PCT/NL98/00245	International filing date (day/month/year) 04 May 1998 (04.05.98)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address

ITREC B.V.
Linscotenstraat 35
P.O. Box 1098
NL-3004 AB Rotterdam
Netherlands

State of Nationality

NL

State of Residence

NL

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address

ITREC B.V.
P.O. Box 150
NL-3100 AD Schiedam
Netherlands

State of Nationality

NL

State of Residence

NL

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned
☐ the International Searching Authority ☒ the elected Offices concerned
☐ the International Preliminary Examining Authority ☐ other:
The International Bureau of WIPO
34, chemin des Colonnnettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Kari Huynh-Khuong

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 07 December 1998 (07.12.98)	
International application No. PCT/NL98/00245	Applicant's or agent's file reference BO 40971
International filing date (day/month/year) 04 May 1998 (04.05.98)	Priority date (day/month/year) 06 May 1997 (06.05.97)
Applicant DE GROOT, Anne, Klaas et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

10 November 1998 (10.11.98)

☐ in a notice effecting later election filed with the International Bureau on:
2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Jocelyne Rey-Millet

Telephone No.: (41-22) 338.83.38

PCI

03.06.98

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving office use only	
PCT/NL 98 / 00245	
International Application No.	
04 MAY 1998	04.05.98
International Filing Date	
BUREAU VOOR DE INDUSTRIËLE EIGENDOM P.C.T. INTERNATIONAL APPLICATION	
Name of receiving Office and "PCT International Application"	
Applicant's or agent's file reference (if desired) (12 characters maximum) BO 40971	

Box No. I	TITLE OF INVENTION Tensioner	
Box No. II	APPLICANT	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)		<input type="checkbox"/> This person is also inventor. Telephone No. Facsimile No. Teleprinter No.
ITREC B.V. (Linscotenstraat 35) P.O. Box 10098 NL-3004 AB ROTTERDAM The Netherlands (NL)		
State (i.e. country) of nationality: The Netherlands (NL)		State (i.e. country) of residence: The Netherlands (NL)
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input checked="" type="checkbox"/> all designated States except the United States of America <input type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box		
Box No. III	FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)		This person is: <input type="checkbox"/> applicant only <input checked="" type="checkbox"/> applicant and inventor <input type="checkbox"/> inventor only (if this check-box is marked, do not fill in below.)
DE GROOT, Anne Klaas Werdorperwaard 8 NL-3984 PR ONDIJK The Netherlands (NL)		
State (i.e. country) of nationality: The Netherlands (NL)		State (i.e. country) of residence: The Netherlands (NL)
This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box		
<input checked="" type="checkbox"/> Further applicants and/or (further) inventors are indicated on a continuation sheet.		
Box No. IV	AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: <input checked="" type="checkbox"/> agent <input type="checkbox"/> common representative		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		Telephone No.
DE BRUIJN, Leendert C. et al Nederlandsch Octrooibureau Scheveningseweg 82, P.O. Box 29720 NL-2502 LS THE HAGUE THE NETHERLANDS		70 3527500
		Facsimile No.
		70 3527528
		Teleprinter No.
<input type="checkbox"/> Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.		

Form PCT/RO/101 (first sheet) (January 1997; reprint January 1998)

See Notes to the request form

SUBSTITUTE SHEET (RULE 26)

Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS

If none of the following sub-boxes is used, this sheet is not to be included in the request.

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

KALKMAN, Piet
Kievitdreef 45
NL-2743 ED WADDINXVEEN
The Netherlands

This person is:

- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:
The Netherlands (NL)State (i.e. country) of residence:
The Netherlands (NL)This person is applicant
for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant
for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant
for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)

This person is:

- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only (If this check-box is marked, do not fill in below.)

State (i.e. country) of nationality:

State (i.e. country) of residence:

This person is applicant
for the purposes of:

- ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

Box No. V DESIGNATIONS STATES

The following designations are made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☐ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☐ **EP** European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|--|--|
| <input type="checkbox"/> AL Albania | <input type="checkbox"/> LT Lithuania |
| <input type="checkbox"/> AM Armenia | <input type="checkbox"/> LU Luxembourg |
| <input type="checkbox"/> AT Austria | <input type="checkbox"/> LV Latvia |
| <input checked="" type="checkbox"/> AU Australia | <input type="checkbox"/> MD Republic of Moldova |
| <input type="checkbox"/> AZ Azerbaijan | <input type="checkbox"/> MG Madagascar |
| <input type="checkbox"/> BA Bosnia and Herzegovina | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input type="checkbox"/> BB Barbados | |
| <input type="checkbox"/> BG Bulgaria | <input type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BR Brazil | <input type="checkbox"/> MW Malawi |
| <input type="checkbox"/> BY Belarus | <input type="checkbox"/> MX Mexico |
| <input type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> NO Norway |
| <input type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input type="checkbox"/> NZ New Zealand |
| <input type="checkbox"/> CN China | <input type="checkbox"/> PL Poland |
| <input type="checkbox"/> CU Cuba | <input type="checkbox"/> PT Portugal |
| <input type="checkbox"/> CZ Czech Republic | <input type="checkbox"/> RO Romania |
| <input type="checkbox"/> DE Germany | <input type="checkbox"/> RU Russian Federation |
| <input type="checkbox"/> DK Denmark | <input type="checkbox"/> SD Sudan |
| <input type="checkbox"/> EE Estonia | <input type="checkbox"/> SE Sweden |
| <input type="checkbox"/> ES Spain | <input type="checkbox"/> SG Singapore |
| <input type="checkbox"/> FI Finland | <input type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GB United Kingdom | <input type="checkbox"/> SK Slovakia |
| <input type="checkbox"/> GE Georgia | <input type="checkbox"/> SL Sierra Leone |
| <input type="checkbox"/> GH Ghana | <input type="checkbox"/> TJ Tajikistan |
| <input type="checkbox"/> GM Gambia | <input type="checkbox"/> TM Turkmenistan |
| <input type="checkbox"/> GW Guinea-Bissau | <input type="checkbox"/> TR Turkey |
| <input type="checkbox"/> HU Hungary | <input type="checkbox"/> TT Trinidad and Tobago |
| <input type="checkbox"/> ID Indonesia | <input type="checkbox"/> UA Ukraine |
| <input type="checkbox"/> IL Israel | <input type="checkbox"/> UG Uganda |
| <input type="checkbox"/> IS Iceland | <input checked="" type="checkbox"/> US United States of America |
| <input type="checkbox"/> JP Japan | |
| <input type="checkbox"/> KE Kenya | <input type="checkbox"/> UZ Uzbekistan |
| <input type="checkbox"/> KG Kyrgyzstan | <input type="checkbox"/> VN Viet Nam |
| <input type="checkbox"/> KP Democratic People's Republic of Korea | <input type="checkbox"/> YU Yugoslavia |
| | <input type="checkbox"/> ZW Zimbabwe |
| <input type="checkbox"/> KR Republic of Korea | |
| <input type="checkbox"/> KZ Kazakhstan | |
| <input type="checkbox"/> LC Saint Lucia | |
| <input type="checkbox"/> LK Sri Lanka | |
| <input type="checkbox"/> LR Liberia | |
| <input type="checkbox"/> LS Lesotho | |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

- ☐
- ☐
- ☐

In addition to the designations made above, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of

The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Box No. VI PRIORITY CLAIM

Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

Country (in which, or for which, the application was filed)	Filing Date (day/month/year)	Application No.	Office of filing (only for regional or international application)
item (1) the Netherlands	06 May 1997 (06-05-1997)	1005992	
item (2)			
item (3)			

Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): 1

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): ISA / EOB

Earlier search Fill in where a search (international, international-type or other) by the International Searching Authority has already been carried out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. Identify such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request.

Country (or regional Office):

Date (day/month/year):

Number:

The Netherlands

06-01-1998

SN 29239 NL

Box No. VIII CHECK LIST

This international application contains the following number of sheets:

1. request : 4 sheets
 2. description : 7 sheets
 3. claims : 2 sheets
 4. abstract : 1 sheets
 5. drawings : 3 sheets

Total : 17 sheets

This international application is accompanied by the item(s) marked below:

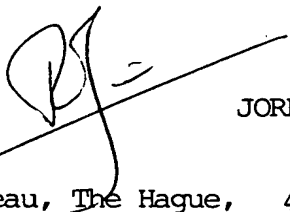
1. ☐ separate signed power of attorney
 2. ☐ copy of general power of attorney
 3. ☐ statement explaining lack of signature
 4. ☐ priority document(s) identified in Box No. VI as item(s):
 5. ☒ fee calculation sheet
 6. ☐ separate indications concerning deposited microorganisms
 7. ☐ nucleotide and/or amino acid sequence listing (diskette)
 8. ☒ other (specify):

copy earlier sear report

Figure No. _____ of the drawings (if any) should accompany the abstract when it is published.

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



JORRITSMA, Ruurd

Nederlandsch Octrooibureau, The Hague, 4 May 1998

For receiving Office use only

1. Date of actual receipt of the purported international application:	04 MAY 1998 (04.05.98)	2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority specified by the applicant: ISA /	6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid	

For International Bureau use only

Date of receipt of the record copy by the International Bureau:

04 JUNE 1998

(04.06.98)

Titel: Tensioner..

De uitvinding heeft betrekking op een tensioner, voor het inklemmen en gecontroleerd voortbewegen van kabels, buigzame pijpen of staven, 5
omvattende ten minste twee transport-middelen, elk bestemd voor verplaatsing van een of meer klemorganen, waarvan de vorm is aangepast aan de uitwendige vorm van de kabels, buigzame pijpen of staven en waarbij de transportmiddelen elk aan een hoofdframe-element zijn bevestigd, een en ander zodanig dat de klemorganen klemmend om de 10
kabels, buigzame pijpen of staven verplaatsbaar zijn.

Tensioners worden onder meer gebruikt bij het leggen van kabel en buigzame pijpen vanaf een schip, bijvoorbeeld op de bodem van de zee. De kabels, de buigzame pijpen of de staven worden met behulp van de 15
tensioner vanaf het schip via de zogenaamde S- of J-methode naar de zeebodem geleid. Wanneer de S-methode wordt gebruikt, verlaat de kabel of de buigzame pijp het schip in hoofdzaak in horizontale richting en zal de kabel of de buigzame pijp via een S-bocht verbonden zijn met het inmiddels op de (zee)bodem aangebrachte gedeelte. Wordt de J- 20
methode gebruikt, dan verlaat de kabel of de buigzame pijp het schip in hoofdzaak in verticale richting en is deze via een J-vormige bocht met het inmiddels op de bodem belande gedeelte verbonden.

De taak van de tensioner is tweeledig. In de eerste plaats moet de 25
tensioner de kabel of de buigzame pijp kunnen vastklemmen, om te voorkomen dat deze, door het gewicht van het inmiddels overboord gezette gedeelte, met een ongecontroleerde snelheid het schip verlaat. Het gewicht dat de tensioner op deze manier moet afstoppen, kan erg oplopen. De tensioner moet daarom een hoge klemkracht op de kabel of 30
de buigzame pijp kunnen ontwikkelen. De tweede taak van de tensioner is om de kabels en de buigzame pijpen voort te bewegen. De maximale snelheid waarmee dat gebeurt is onder meer afhankelijk van de bodemgesteldheid ter plaatse. Bovendien moet de kabel of de buigzame pijp in de meeste gevallen nog, tijdens het leggen, op het dek van het 35
schip worden geassembleerd. De snelheid waarmee het geassembleerde gedeelte overboord wordt gezet, is dus ook afhankelijk van de tijd die nodig is voor het assembleren van de kabel of de buigzame pijp zelf.

Om aan de eisen die aan de tensioners gesteld worden te kunnen

voldoen, worden in de tensioners volgens de stand van de techniek veelal tenminste twee eindloze transporteurs ingebouwd. Door de transporteurs met grote kracht naar elkaar toe te bewegen, kan op de daartussen gelegen kabel of buigzame pijp een grote klemkracht worden
5 gezet. Door vervolgens de transporteurs aan te drijven kan de kabel of de buigzame pijp, zonder dat de klemkracht wegvalt, worden voortbewogen. Aangezien de kabels en de buigzame pijpen een in hoofdzaak ronde doorsnede hebben, worden de transporteurs in een tensioner met daarin twee transporteurs, onder een hoek van 180°
10 geplaatst. In een tensioner met drie transporteurs, maken deze een onderlinge hoek van 120° . Bij vier transporteurs is hun onderlinge hoek steeds 90° .

Een belangrijk nadeel van de tensioners volgens de stand van de
15 techniek is, dat de uitvoering van een tensioner en het aantal transporteurs dat daarin wordt gemonteerd, afhangt van het kabel- of buigzame pijp-type waarvoor de tensioner is ontworpen. Zo zal een flexibele pijp met bijvoorbeeld een grote diameter en een relatief dunne wand, door twee transporteurs in een ellips-vorm gedrukt kunnen
20 worden. De tensioner voor dergelijke flexibele pijpen is daarom veelal met drie of vier transporteurs uitgerust. Dat betekent dat de exploitanten van de schepen voor het leggen van kabels en buigzame pijpen voor elk type kabel of buigzame pijp een aparte tensioner moeten aanschaffen. En dat vraagt om relatief hoge investeringen.

25 Een ander belangrijk nadeel van de tensioners volgens de stand van de techniek is verder dat aan boord van een schip, wegens ruimtegebrek, meestal slechts een tensioner aanwezig is. Op zee overschakelen van het ene type tensioner op een ander type tensioner is daarmee
30 onmogelijk.

Een derde nadeel van de tensioners volgens de stand van de techniek is, dat de tensioners relatief volumineus zijn. Het vervoer van de tensioners volgens de stand van de techniek is vanwege de omvang en
35 gewicht daarvan erg kostbaar.

Het is het doel van de onderhavige uitvinding om een tensioner te maken die de nadelen van de tensioners volgens de stand van de

techniek niet heeft.

Om dat doel te bereiken wordt de tensioner volgens de onderhavige uitvinding voorzien van transportmiddelen met klemorganen, waarbij de transportmiddelen met de klemorganen zodanig modulair zijn uitgevoerd, dat met behulp van een aantal transportmiddelen en een aantal hoofdframe-elementen verschillende tensioner-uitvoeringsvormen zijn op te bouwen.

Het voordeel van een modulair opgebouwde tensioner is in de eerste plaats het feit dat met behulp van een beperkt aantal (tenminste twee) gelijke transportmiddelen, verschillende tensioners kunnen worden samengesteld. Door de beschikbaarheid van de modulair op te bouwen tensioner, vraagt niet ieder nieuwe type kabel of buigzame pijp om de aanschaf van een nieuw type tensioner. In plaats van een groot aantal verschillende tensioners, kan een gebruiker volstaan met de aanschaf van een beperkt aantal van deze transportmiddelen. Bovendien hebben de modulair op te bouwen tensioners een relatief laag gewicht en zijn deze compact op te bouwen.

Er wordt naar gestreefd dat de transportmiddelen met de klemorganen zodanig modulair zijn uitgevoerd, dat deze elk in een ISO-container passen.

Door de afmetingen van de transportmiddelen af te stemmen op de grootte van ISO-containers, kunnen de transportmiddelen in een container, of op de plaats van een container kan worden vervoerd. Het vervoer van een tensioner volgens de stand van de techniek vraagt altijd om speciale voorzorgsmaatregelen en is daarom relatief kostbaar. Door de afmetingen van de transportmiddelen aan te passen aan de maten van ISO-containers vraagt het vervoer van de tensioner-modules volgens de onderhavige uitvinding geen speciale voorzorgsmaatregelen. De transportkosten van een modulaire tensioners zullen daardoor veel lager zijn dan de transportkosten van een volumineuze tensioner volgens de stand van de techniek.

Het is voordelig wanneer de transportmiddelen bevestigingsogen omvatten voor het bevestigen van de transportmiddelen aan een hoofdframe-element.

Het voordeel van deze maatregel is, dat een tensioner volgens de

onderhavige uitvinding eenvoudig en in relatief korte tijd kan worden op- of omgebouwd.

De tensioner volgens de onderhavige uitvinding wordt nog verbeterd
5 wanneer de transportmiddelen een basisframe en een daarop verplaatsbaar aangebrachte transporteur omvatten, waarbij de transporteur met behulp van tenminste een hydraulische cilinder en tenminste een eerste en een tweede zwenkarm in hoofdzaak parallel ten opzichte van dat basis-frame beweegbaar aan dat basisframe is
10 bevestigd.

Het is daarbij bovendien voordelig wanneer de hydraulische cilinder en de zwenkarmen allemaal zowel aan het basisframe als aan de transporteur zijn bevestigd, waarbij de bevestigingsplaats van de hydraulische cilinder aan het basisframe overeenkomt met de
15 bevestigingsplaats van de eerste zwenkarm daaraan en waarbij de bevestigingsplaats van de cilinder aan de transporteur overeenkomt met de bevestigingsplaats van de tweede zwenkarm daaraan.

Het voordeel van een dergelijke constructie is, dat voor de verplaatsing van de transporteur ten opzichte van het basisframe,
20 alleen de hydraulische cilinder hoeft te worden aangestuurd. Door de zwenkarmen wordt de transporteur in deze constructie parallel gehouden langs het basisframe.

In een voordelige uitvoeringsvorm van de onderhavige uitvinding,
25 omvatten de transportmiddelen een transporteur die is voorzien van een dubbel uitgevoerde aandrijfketting.

Door een dubbele ketting te gebruiken, zal de transporteur minder snel de neiging hebben om te gaan kantelen, aangezien de ondersteuning van de band breder wordt. De 'wielbasis' van de band wordt, bij wijze van
30 spreken, breder door het gebruik van een dubbele ketting. Door deze maatregel wordt de stabiliteit van de tensioner volgens de onderhavige uitvinding aanmerkelijk verbeterd ten opzichte van tensioners volgens de stand van de techniek.

35 De onderhavige uitvinding betreft niet alleen een tensioner, maar ook modulair uitgevoerd transportmiddel, bestemd voor de tensioner volgens de onderhavige uitvinding. Het is daarbij voordelig dat ten minste twee transportmiddelen volgens de onderhavige uitvinding met behulp

van hoofd-frame elementen met elkaar verbonden zijn, waarbij bij voorkeur een beperkt aantal varianten van die hoofd-frame elementen voldoet voor het naar keuze opbouwen van een tensioner met 2, 3, 4 of meer transportmiddelen. Dat heeft als voordeel dat met een beperkt
 5 aantal middelen samen met een beperkt aantal hoofdframe-elementen voor elk type kabel of buigzame pijp een geschikte tensioner kan worden opgebouwd. Voorts biedt dit de mogelijkheid om zeer compact te bouwen.

De opbouw en het gebruik van de onderhavige uitvinding zullen worden
 10 verduidelijkt aan de hand van de volgende tekeningen waarin:

Figuur 1 schematisch weergeeft hoe een kabel of een buigzame pijp via de S-methode overboord wordt gezet.

15 Figuur 2 schematisch weergeeft hoe een kabel of een buigzame pijp via de J-methode overboord wordt gezet.

Figuur 3 een zijaanzicht is van de transportmiddelen volgens de onderhavige uitvinding.

20 Figuur 4 een dwarsdoorsnede is over de lijn IV-IV van de transportmiddelen volgens figuur 3.

Figuur 5 een dwarsdoorsnede is van een tensioner met daarin drie
 25 transportmiddelen volgens de onderhavige uitvinding.

Figuur 6 een dwarsdoorsnede is van een tensioner met daarin twee of vier transportmiddelen volgens de onderhavige uitvinding.

30 In figuur 1 is schematisch het geval weergegeven dat met behulp van een op een schip 1 geplaatste tensioner 2 een kabel of een buigzame pijp 4 via de zogenaamde S-methode op de bodem 5 van bijvoorbeeld de zee wordt gelegd. In figuur 1 is te zien dat de kabel of de buigzame
 35 pijp 4 het schip 1 in hoofdzaak in horizontale richting verlaat. Het gedeelte van de kabel of buigzame pijp 4 dat wordt vastgeklemd door de tensioner 2 is via een S-bocht verbonden met het inmiddels op de bodem 5 gelegde gedeelte.

In figuur 2 is schematisch het geval weergegeven dat een kabel of een buigzame pijp 4 met behulp van een tensioner 2 vanaf een schip 1 via de zogenaamde J-methode op de bodem 5 van bijvoorbeeld de zee wordt gelegd. In de figuur is te zien dat de kabel of buigzame pijp 4 het schip 1 in hoofdzaak in verticale richting verlaat. Het gedeelte van de kabel of de buigzame pijp 4 dat wordt vastgeklemd door de tensioner 2 is in een J-vormige bocht verbonden met het inmiddels op de bodem 5 belande gedeelte.

- 10 Uit de figuren 1 en 2 wordt duidelijk dat de tensioner 2 twee functies heeft. In de eerste plaats moet de tensioner 2 voorkomen dat de kabel of de buigzame pijp 4 door het eigen gewicht daarvan uit zichzelf het schip 1 verlaat. Daarom moet de tensioner 2 in staat zijn de kabel of de buigzame pijp 4 vast te klemmen. In de tweede plaats moet de
- 15 tensioner 2 de kabel of buigzame pijp 4 overboord kunnen bewegen zonder dat die klemkracht wegvalt. De tensioner 2 is daarom voorzien van ten minste twee transportmiddelen 3, met daarin transporteurs. De transporteurs kunnen naar elkaar toe worden bewogen om een kabel of een buigzame pijp 4 vast te klemmen. Door de transporteurs bovendien
- 20 aan te drijven, kan de kabel of buigzame pijp 4 met een gecontroleerde snelheid het schip 1 verlaten.

- In figuur 3 zijn de transportmiddelen afgebeeld volgens de onderhavige uitvinding. De transportmiddelen 3 bestaan uit een basisframe 31 en
- 25 een beweegbaar ten opzichte van dit basisframe 31 aangebrachte transporteur 39. De transporteur 39 is bijvoorbeeld aan het basisframe 31 bevestigd met behulp van ten minste een hydraulische cilinder 32 en twee zwenkarmen 33. De hydraulische cilinder 32 en de zwenkarmen 33 zijn bij voorkeur via bevestigingsogen 34 aan het basisframe 31
- 30 bevestigd. De transporteur 39 bestaat op zijn beurt onder meer uit klemorganen 35 die tegen een te verplaatsen kabel of buigzame pijp 4 geduwd kunnen worden. De klemorganen 35 zijn geplaatst op een ketting 36. Die ketting 36 is bij voorkeur dubbel uitgevoerd om de klemorganen 35 over de breedte daarvan te kunnen ondersteunen (zie figuur 4). De
- 35 ketting 36 van de transporteur wordt bijvoorbeeld voortbewogen met behulp van een tandwiel 37. Bovendien is het basisframe 31 voorzien van bevestigingsogen 38, waarmee de transportmiddelen 3 op een eenvoudige manier aan bijvoorbeeld een hoofdframe kunnen worden

verbonden.

In figuur 4 is een dwarsdoorsnede te zien van de transportmiddelen 3 over de lijn IV-IV, volgens figuur 3. De dubbele ketting 36 zorgt ervoor dat de klemorganen 35 niet kunnen kantelen ten opzichte van het basisframe 31, ook niet wanneer deze organen 35 worden onderworpen aan relatief grote drukkrachten. Het is voordelig wanneer de klemorganen 35 aan het naar de buitenzijde oppervlak daarvan een in hoofdzaak ringvormige of V-vormige uitsparing 40 hebben. Hierdoor zal de gezamenlijke omtrek die de klemorganen 35 van in een tensioner geplaatste transporteuren 39 (zie figuur 5 en 6) begrenzen ook ringvormig zijn.

In figuur 5 is een tensioner te zien die is opgebouwd uit drie transportmiddelen 3 volgens de onderhavige uitvinding. De modules 3 zijn aan elkaar bevestigd met behulp van hoofdframe-elementen 50. In de figuur is te zien dat de hoofdframe-elementen 50 via de bevestigingsogen 38 aan de transportmiddelen 3 zijn verbonden.

In figuur 6 is het geval weergegeven dat een kabel of een buigzame pijp 4 wordt omringd door twee of vier (gestreept weergegeven) transportmiddelen 3 volgens de onderhavige uitvinding.

Uit de figuren 5 en 6 blijkt dat het mogelijk is naar keuze twee, drie, vier, of indien gewenst nog meer, transportmiddelen 3 volgens de onderhavige uitvinding samen te bouwen tot één tensioner. Het aantal te gebruiken transportmiddelen 3 zal afhangen van onder meer de dikte, de stijfheid en het gewicht van de te verplaatsen kabel of buigzame pijp. Het voordeel hiervan is dat niet voor ieder kabel- of buigzame pijp-type een speciale tensioner hoeft te worden gebouwd. Met een beperkt aantal transportmiddelen 3 volgens de onderhavige uitvinding en een aantal standaard hoofdframe-elementen 50 kan een variatie aan verschillende tensioners worden opgebouwd.

Conclusies

1. Tensioner, voor het inklemmen en gecontroleerd voortbewegen van kabels, buigzame pijpen of staven, omvattende ten minste twee transport-middelen, elk bestemd voor verplaatsing van een of meer klemorganen, waarvan de vorm is aangepast aan de uitwendige vorm van de kabels, buigzame pijpen of staven en waarbij de transportmiddelen elk aan een hoofdframe-element zijn bevestigd, een en ander zodanig dat de klemorganen klemmend om de kabels, buigzame pijpen of staven verplaatsbaar zijn, met het kenmerk, dat de transportmiddelen (3) met de klemorganen (35) zodanig modulair zijn uitgevoerd, dat met behulp van een aantal transportmiddelen (3) en een aantal hoofdframe-elementen (50) verschillende tensioner-uitvoeringsvormen zijn op te bouwen.

15

2. Tensioner volgens conclusie 1, met het kenmerk, dat de transportmiddelen (3) met de klemorganen (35) zodanig zijn uitgevoerd dat deze elk in een ISO-container passen.

20

3. Tensioner volgens conclusie 1 of 2, met het kenmerk, dat de transportmiddelen (3) bevestigingsogen (38) omvatten voor het bevestigen van de transportmiddelen (3) aan een hoofdframe-element (50).

25

4. Tensioner volgens conclusie 1, 2 of 3, waarbij de transportmiddelen een basisframe en een daarop verplaatsbaar aangebrachte transporteur zonder einde omvatten, met het kenmerk, dat die transporteur (39) met behulp van tenminste een hydraulische cilinder (32) en tenminste een eerste en een tweede zwenkarm (33) in hoofdzaak parallel ten opzichte van het basis-frame (31) beweegbaar aan dat basisframe (31) is bevestigd.

30

5. Tensioner volgens conclusie 1, 2, 3 of 4, met het kenmerk, dat de transporteur (39) voorzien is van een dubbel uitgevoerde aandrijfketting (36).

35

6. Transportmiddel, bestemd voor de tensioner volgens een van de

voorgaande conclusies.

Uittreksel

De uitvinding heeft betrekking op een tensioner, voor het inklemmen en gecontroleerd voortbewegen van kabels, buigzame pijpen of staven, 5
omvattende ten minste twee transport-middelen, elk bestemd voor verplaatsing van een of meer klemorganen, waarvan de vorm is aangepast aan de uitwendige vorm van de kabels, buigzame pijpen of staven en waarbij de transportmiddelen elk aan een hoofdframe-element zijn bevestigd, een en ander zodanig dat de klemorganen klemmend om de 10
kabels, buigzame pijpen of staven verplaatsbaar zijn, waarbij met behulp van een aantal standaard elementen, tensioners op verschillende wijzen kunnen worden opgebouwd.

fig -1

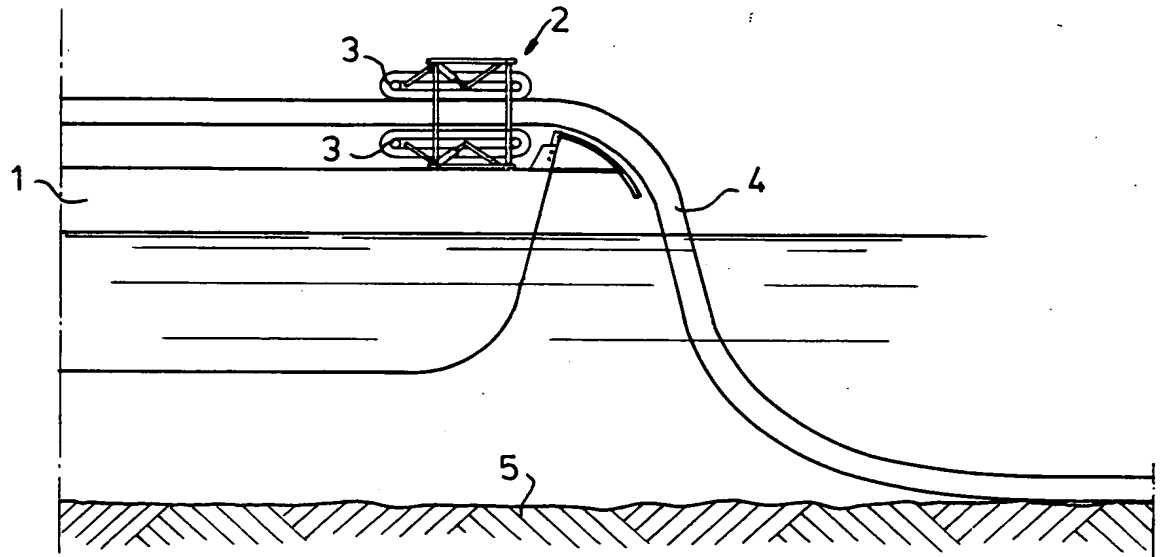


fig -2

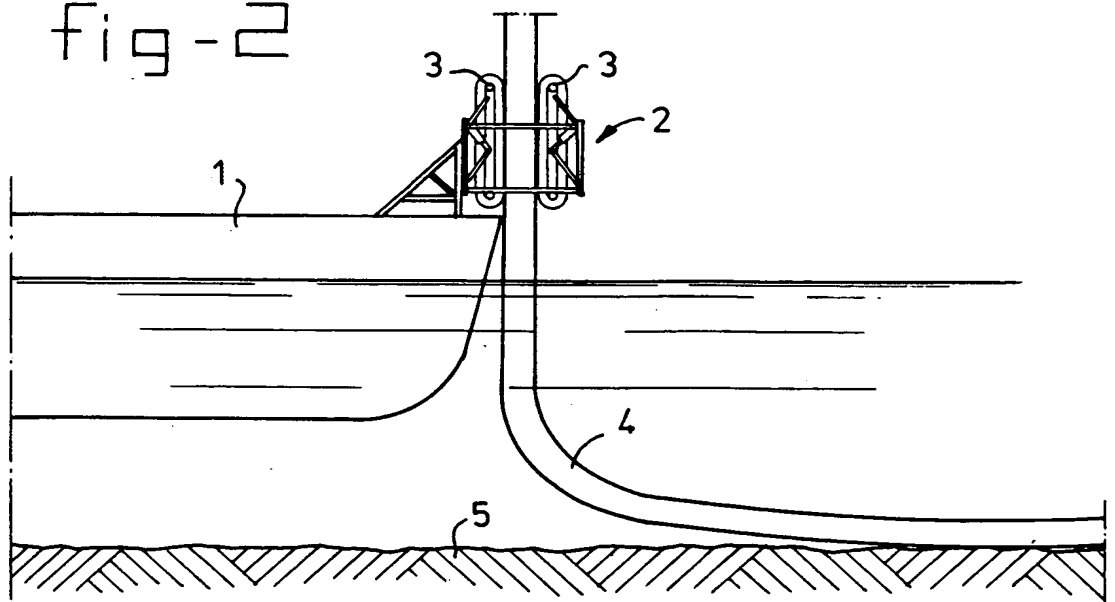


fig - 3

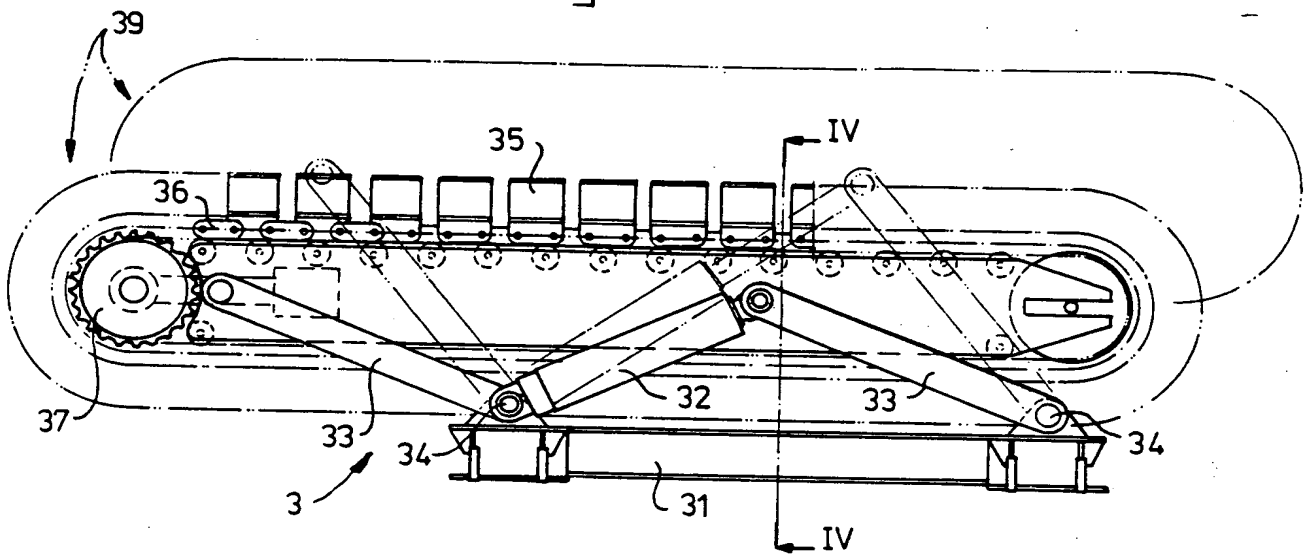
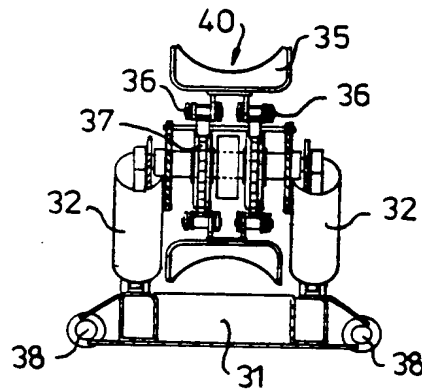


fig - 4



3/3

fig-5

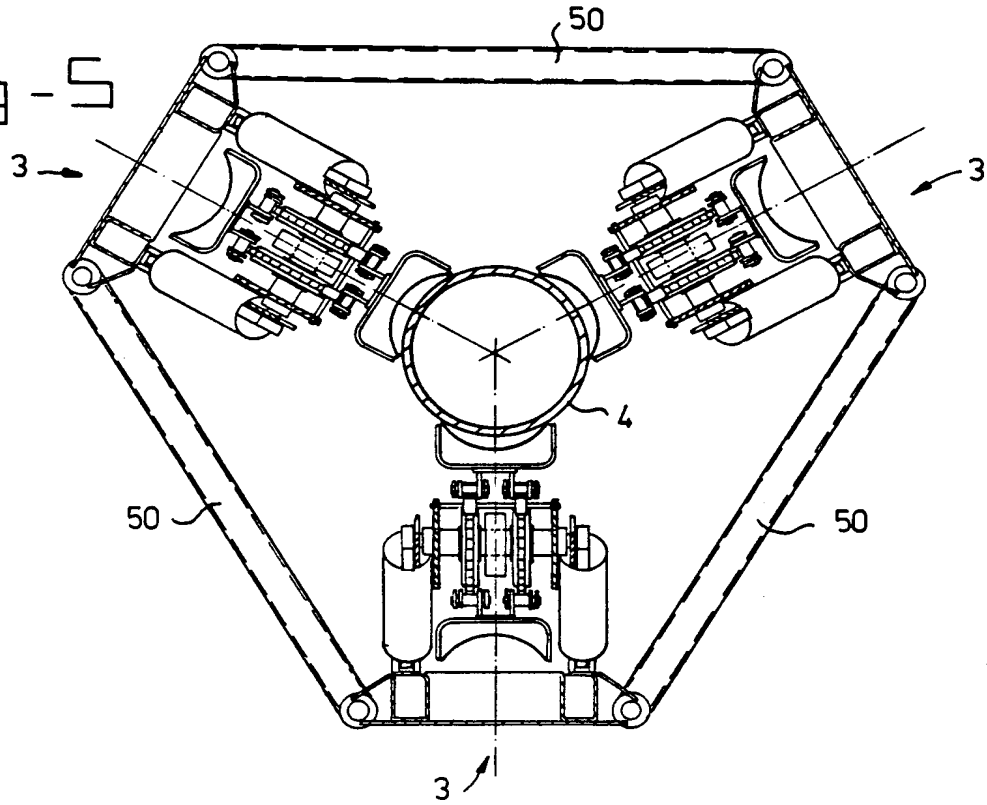


fig-6

